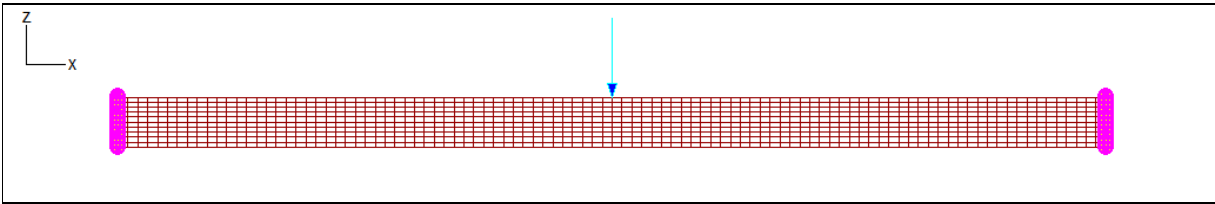


Validation of Sargon Nonlinear solver (CURAN, version 9.60)			
TEST MB008	VALIDATION, CROSS CHECKS, RELIABILITY, BENCHMARK	Marco Croci	25/11/2010



Test description	
Constitutive law of membranes material: linear elastic. Solution should coincide with a linear elastic solution.	
Theoretical check and cross-check with Sargon linear solver (CLEVER)	
Test model: curanMB_008.WSR	Target model: C008MB_CLEVER.WSR

Material properties		
Name	ν	E
S235LE	0,3	210000N/mm ²

Model data

Beam			Constraints		Load (z direction)	
LENGTH	HEIGHT	THICKNESS	LEFT	RIGHT	APPLICATION POINT	FORCE
10000mm	500mm	100mm	Fixed	Fixed	Middle point	-100000N

Membrane elements	Type	Thickness	d.o.f.
1000 (10x100)	QM6WI	100mm	2178

CROSS CHECK

Displacement in the middle of the beam is $\delta = FL^3/192EI + L\chi T/2GA$ where χ is shear factor and T is internal shear force

Load case	Value	Unit	CURAN	TARGET	KIND	% diff.
1	Node 127 displacement (z)	mm	-2,437E+00	-2,455E+00	theoretical	-0,74
1	σ_x element 53, node 113	N/mm ²	2,218E+01	2,218E+01	cross-check	0,00
1	σ_z element 53, node 113	N/mm ²	1,640E-01	1,640E-01	cross-check	0,00

% difference = (CURAN - TARGET) / TARGET * 100

Precision of limit multiplier for the analysis: 0.005
 QM6WI: 4 nodes incompatible element with Wilson-Ibrahimbegovic modification